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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/421,781 | 10/19/1999 | JUENG GIL LEE | CDST-C130 | 4608 |

7590 06/18/2003
WAGNER MURABITO AND HAO LLP
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SAN JOSE, CA 95113

EXAMINER

ROY, SIKHA

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| ART UNIT | PAPER NUMBER |
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2879

DATE MAILED: 06/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Supplemental
Office Action Summary

Application No.

09/421,781

Applicant(s)

LEE ET AL.

Examiner

Sikha Roy

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-8,10-20,54,58-60,67 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 67 is/are allowed.
- 6) ☐ Claim(s) 1-8,10-20,54,58-60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 11, 2003 has been entered.

Claims 55-57, 68 and 69 have been cancelled.

Claim Objections

Claim 60 is objected to because of the following informalities:

In claim 60 line 1, 'claim 55' which has been cancelled should be replaced by -- claim 58--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3,10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of U. S. Patent 5,894,188 to Chakvorty et al.

Regarding claims 1 and 20, Shen et al. disclose (column 3 lines 40-67) a field emission display comprising first conductive electrodes 20 formed on an insulating substrate 30, a resistive layer 40 overlying first electrodes 20, a dielectric layer 70, second conductive electrodes 60 having plurality of apertures formed on the dielectric layer. At least one of the first and second conductive electrodes (layers) is formed of metal alloy comprising titanium tungsten (TiW) and aluminum. Shen et al. further disclose (column 4 lines 14-16,28,29) the conductive electrode (conductor 20) comprising of sublayers 20a comprising titanium tungsten and 20b comprising aluminum only.

Claim 1 differs from Shen et al. in that Shen et al. do not exemplify the first electrodes comprising a cladding layer disposed over the metal alloy.

Chakvorty et al. in analogous art of metal for flat panel display disclose (Column 5 lines 60,61 Fig. 1C) a cladding layer 104 deposited on the electrode 103. Chakvorty et al. further disclose (column 8 lines 19-26) that the refractory metals molybdenum and tungsten which are easy to process and make good electrical contact with aluminum conductors are used as cladding layer so as to seal each aluminum strip forming row or column metal strips.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to add to the first electrodes of Shen et al. cladding layer as suggested by Chakvorty for sealing each electrode.

Referring to claims 2 and 3, Shen et al. disclose (column 3 lines 60-67) the second electrodes 60 are arranged as rows of conductive bands across the surface of the substrate and the first electrodes 20 are arranged as columns of conductive bands across the substrate 30 substantially orthogonal to the second electrodes thereby permitting matrix-addressed selection of microtips 50 at the intersection of a row and a column corresponding to a pixel. The two sets of electrodes being orthogonal to each other, the first set of electrodes can be arranged as rows and the second set of electrodes arranged as columns.

Referring to claim 10 Chakvorty et al. disclose (column 8 lines 19-26) the cladding layer comprising molybdenum and tungsten disposed over the first electrode.

Claims 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. and U. S. Patent 5,894,188 to Chakvorty et al. in view of U. S. Patent 6,320,138 to Kamiya et al.

Claims 4-7 differ from Shen et al. and Chakvorty et al. in that Shen et al. and Chakvorty do not exemplify the metal alloy of the electrodes made of aluminum alloy comprising .5 to 6 atomic percent neodymium and titanium.

Referring to claims 4- 8, Kamiya in relevant art conductor formed of low-resistance aluminum alloy discloses (column 5 lines 5,6) Al-Nd-Ti alloy thin film formed with the substrate. It is noted that the occurrence of any hillock and pinhole in the thin film conductor can be suppressed by setting the concentrations of neodymium and titanium. Kamiya discloses (column 7 lines 16-18, claim 2) the conductor made of an aluminum alloy consisting essentially of aluminum, neodymium and titanium setting the concentration of neodymium in the alloy 2.0 atomic %.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the alloy of the conducting electrodes of Shen et al. and Chakvorty by aluminum alloy comprising neodymium and titanium as taught by Kamiya for suppressing the hillock and pinhole occurrences in the thin film conductor.

Regarding claim 8 Shen, Chakvorty and Kamiya disclose the claimed invention except for the limitation of aluminum alloy comprising approximately 4 to 5 atomic % titanium. Kamiya has disclosed that the specific resistance of the aluminum alloy depends on the titanium concentration and the heat-treatment temperature, the higher is the temperature the lower is specific resistance. For higher temperature the metal alloy has higher concentration of titanium with the same result of suppressing hillocks. This is evidenced by Mori et al. (U.S. Patent 5,243,202) where the electrode with aluminum and titanium alloy contains 4.2atomic % titanium. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the

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concentration of titanium to be 4-5 atomic percent, since optimization of workable ranges is considered within the skill of the art.

Claims 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. and U. S. Patent 5,894,188 to Chakvorty et al. in view of U. S. Patent 6,265,822 to Kuroda et al.

Regarding claims 11,12,14,16, Shen et al. and Chakvorty et al. do not exemplify the metal alloy comprising silver alloy having palladium, copper and titanium.

Kuroda et al. in relevant art of electron beam apparatus disclose (column 15 lines 61-67) cold cathode elements disposed in matrix pattern and the conductive material used for electrodes selected from metals such as Mo, W, Ti, Cu, Pd and Ag and alloys of these metals. It is further noted these metals and their alloys can be formed easily in the form of a fine particle film having excellent electron emission characteristics and can be manufactured easily (column 15 lines 22-25). The lower the content of the transition metal (copper, palladium) the lower becomes the thin film resistance when the electrode serve as a wiring conductive layer.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the metal alloy of the electrodes of Shen et al. and Chakvorty by silver alloy comprising palladium, copper and titanium as disclosed by Kuroda et al. for forming the electrodes easily by vapor deposition in the form of thin film with excellent emission characteristics.

Regarding claims 13,15 and 17 Shen et al. and Chakvorty in view of Kuroda et al. disclose the claimed invention except for the limitation of range of

concentration of palladium, copper and titanium from .5 to 2 atomic percent. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide range of concentration from .5 to 2 atomic percent, since optimization of workable ranges is considered within the skill of the art.

Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being -unpatentable over U. S. Patent 5,594,297 to Shen et al. and U. S. Patent 5,894,188 to Chakvorty et al. in view of U. S. Patent 6,064,149 to Raina.

Regarding claims 18,19, Shen et al. and Chakvorty do not disclose a passivation layer comprising silicon nitride disposed over the plurality of second electrodes.

Raina in analogous art of field emission device discloses (column 8 lines38-42 Fig.4) a passivation layer 56 consisting of silicon nitride formed over the gate metal layer. It is to be noted that this passivation layer protects the entire set of layers underneath.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to add a passivation layer of silicon nitride as taught by Raina disposed over the second electrodes of Shen et al. and Chakvorty to protect the conductive second electrodes and dielectric layer underneath.

Claims 54,58 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,064,149 to Raina in view of WO 98/43268 to Amey.

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Referring to claim 54 Raina discloses (Figs. 2 and 4, column 5 lines 60-67, column 6 lines 25-40, column 8 lines 22-41) an electrode (cathode) structure for a field emission display device comprising a plurality of first electrodes 34, a resistor layer 36 disposed over the first electrodes, a dielectric layer 40 disposed over the resistor layer, plurality of second electrodes 44 disposed over the dielectric layer and a passivation layer 56 comprising silicon nitride disposed over the second electrodes.

Raina does not disclose a gate structure disposed over the passivation layer of silicon nitride or between the second electrodes and passivation layer or between the second electrodes and the dielectric layer.

Amey in pertinent art of field emitter cathode backplate structures discloses (page 7 lines 8-12 Fig. 3(a)) a gate structure (electrical conductor 17) formed over a dielectric layer 15 for serving as additional control or focusing the electrons.

Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to add a gate structure as taught by Amey on the passivation layer of Raina for additional control or focusing the electron from the emitter.

Regarding claim 58 Raina and Amey disclose the claimed invention except for the limitation of gate structure disposed between the second electrodes and the dielectric layer. It has been held that rearranging of parts of an invention involves only routine skills in the art. *In re Japikse*, 86 USPQ 70. Thus, it would have been obvious to one having ordinary skills in the art the time the invention was made to dispose the gate structure between the second electrodes and passivation layer or between the second

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electrodes and the dielectric layer, since rearrangement of parts of an invention is considered within the skills of the art.

Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,064,149 to Raina and WO 98/43268 to Amey and further in view of U. S. Patent 5,894,188 to Chakvorty et al.

Raina and Amey do not disclose a tantalum structure disposed between the gate structure and second electrodes.

Chakvorty et al. disclose a cladding layer of tantalum on the first electrodes which makes good electrical contact with the overlying layer. It is further noted tantalum does not inter diffuse with aluminum.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to dispose one layer of tantalum between gate structure (additional conducting electrode for focusing) and second electrodes as separating layer making good electrical contact and preventing any inter diffusion of conducting layers.

Regarding claim 60, Raina and Amey disclose the claimed invention except for the limitation of the second dielectric layer (15) disposed over the layer of silicon nitride. It has been held that rearranging of parts of an invention involves only routine skills in the art. *In re Japikse*, 86 USPQ 70. Thus, it would have been obvious to one having ordinary skills in the art the time the invention was made to dispose the second dielectric layer disposed between the second electrodes and the silicon nitride layer.

Allowable Subject Matter

Claim 67 is allowed over the prior art of record.

The following is an examiner's statement of reasons for allowance:

Regarding claim 67 the prior art of record neither shows nor suggests an electrode structure comprising an evaporated molybdenum layer disposed over the second dielectric layer and a sputtered molybdenum layer disposed over the evaporated molybdenum layer.

Response to Arguments

Applicant's arguments filed February 11, 2003 with respect to the claims 1-20,54-60 have been fully considered but they are not persuasive.

In response to applicants' argument that Chakvorty et al. in combination with Shen et al. do not disclose cladding layer disposed over the metal alloy the Examiner respectfully disagrees. Shen et al. disclose (column 4 lines 27-30) the first electrode (conductor 20) comprising sublayers 20a made of titanium tungsten and 20b made of aluminum. Chakvorty discloses (column 5 lines 40-65 Fig.1C) the backplate includes the electrode (aluminum strip) 103 and the cladding layer 104 disposed over the electrode. Hence it would have been obvious to one of ordinary skill in the art at the time of invention to dispose the cladding layer as taught by Chakvorty et al. on the first electrode of Shen et al. for preventing interdiffusion and providing good electrical contact. The Examiner notes that according to claim 1 cladding layer is disposed on the

first electrodes comprising metal alloy and not on the plurality of second electrodes comprising metal alloy.

Regarding claim 8 Shen, Chakvorty and Kamiya disclose the claimed invention except for the limitation of aluminum alloy comprising approximately 4 to 5 atomic % titanium. Kamiya has disclosed that the specific resistance of the aluminum alloy depends on the titanium concentration and the heat-treatment temperature, the higher is the temperature the lower is specific resistance. For higher temperature the metal alloy has higher concentration of titanium with the same result of suppressing hillocks. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the concentration of titanium to be 4-5 atomic percent, since optimization of workable ranges is considered within the skill of the art.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the

application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Contact Information


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

S.R.

Sikha Roy
Patent Examiner
Art Unit 2879


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